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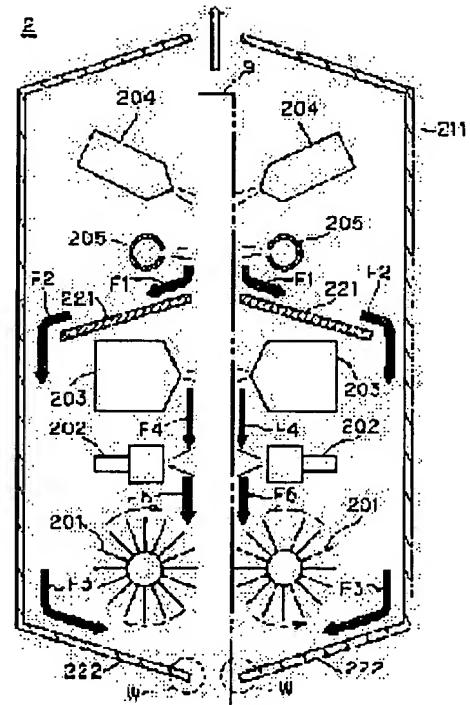
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(54) APPARATUS AND METHOD FOR CLEANING OF SUBSTRATE

(57) Abstract:

PROBLEM TO BE SOLVED: To provide a vertical-type substrate cleaning apparatus by which the quality and the cleaning capability of a substrate are enhanced.

SOLUTION: Second partitions 222, brushes 201, pure-water spray nozzles 202, ultrasonic cleaning nozzles 203, first partitions 221, pure-water supply nozzles 205 and air knives 204 are arranged from the lower part in a treatment part 2 at a substrate cleaning apparatus, by which a cleaning and drying treatment is executed while a substrate 9 in a longitudinal posture is being conveyed to the upper part from the lower part. Thereby, immediately before a drying treatment by the air knives 204, pure water is supplied by the pure-water supply nozzles 205, and a drying irregularity is prevented. In addition, the pure water from the pure-water supply nozzles 205 does not flow into the ultrasonic cleaning nozzles 203, it flows along arrows F1 and arrows F2 on surfaces of the first partitions 221, it flows along arrows F3 and arrows F4 on surfaces of the second partitions 222, and the substrate before being cleaned is moistened in advance in regions W. As a result, while



the drying irregularity is being prevented, a cleaning liquid can be used effectively, and the quality and the cleaning capability of the substrate are enhanced.

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CLAIMS

[Claim(s)]

[Claim 1] A washing means to be the substrate washing station which performs washing processing to the substrate held at the vertical posture as the normal of a principal plane is horizontally suitable mostly, and to wash said principal plane of said substrate, A pure-water supply means to be established above said washing means, to be established between a desiccation means to dry said substrate, and said washing means and said desiccation means, and to supply pure water to said principal plane of said substrate, The substrate washing station characterized by having said washing means, said pure-water supply means, and a conveyance means to move a substrate relatively to said desiccation means, and to pass each [these] means in the sequence concerned.

[Claim 2] The washing process which is the substrate washing approach of performing washing processing to the substrate held at the vertical posture as the normal of a principal plane is horizontally suitable mostly, and washes said principal plane of said substrate, The substrate washing approach characterized by having the pure-water supply process which supplies pure water to the field which washing completed in said washing process among said principal planes, and the desiccation process which dries the field to which pure water was supplied at said pure-water supply process of said substrate.

[Claim 3] The processing unit which is the substrate washing station which performs washing processing, supplying a penetrant remover to the substrate held at the vertical posture so that the normal of a principal plane may be horizontally suitable mostly, and performs processing which includes washing in said substrate, A conveyance means to pass said substrate in the vertical direction relatively to said processing unit, Two or more processing means by which the preparation and said processing unit met said principal plane of said substrate, and were arranged in the vertical direction, One or more [which is extended to the side near the field which contains said principal plane so that the upper part of at least one processing means or a lower part may be divided among said two or more processing means] inclined batches, The substrate washing station characterized by being a means to wash while it **** and at least one of said two or more processing means supplies said penetrant remover to said substrate.

[Claim 4] The substrate washing station which it is a substrate washing station according to claim 3, and one of said two or more processing means is a ultrasonic-cleaning means to perform ultrasonic cleaning to said principal plane of said substrate, and one of said one or more inclined batches is the batch which divides the upper part of said ultrasonic-cleaning means, and is characterized by inclining toward a side lower part near the field containing said principal plane.

[Claim 5] The substrate washing station which is a substrate washing station according to claim 3, and one of said one or more inclined batches is the batch which divides the lower part of said means to wash, and is characterized by inclining toward the side upper part near the field containing said principal plane.

[Claim 6] The body section which is the substrate washing station which performs washing processing using a penetrant remover to the substrate held at the vertical posture as the normal of a principal plane is horizontally suitable mostly, and performs said washing processing using said penetrant remover to said substrate while conveying said substrate, The tank which stores the penetrant remover used in said body section, and a

penetrant remover circulation means to lead the penetrant remover used for said body section to said tank, and to supply the penetrant remover in said tank to said body section, A washing means by which a preparation and said body section perform washing processing using said penetrant remover to said substrate, The substrate washing station with which it has a conveyance means to pass said substrate in the vertical direction relatively to said washing means, and said tank is characterized by being arranged in the side of the under floor in which said body section is installed, or said body section.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the substrate washing station which performs washing processing to the substrate held so that the normal of a principal plane might be horizontally suitable mostly.

[0002]

[Background of the Invention] When performing washing processing to the glass substrate (henceforth a "substrate") used in production of drops, such as a liquid crystal display and a plasma display, the substrate was horizontally conveyed in the condition (henceforth a "horizontal position") that the biggest field (henceforth "principal plane") normal of a substrate turns to the direction of a vertical conventionally, and washing processing has been performed.

[0003] However, in order that washing processing may use penetrant removers, such as a lot of pure water, the container which receives this penetrant remover in a substrate washing station becomes indispensable.

Moreover, since the washing approach changes with the magnitude and the properties of an affix which should be removed from a substrate, washing processing must arrange horizontally a washing means to perform these washing, in order to perform these various washing, and must install the container which moreover receives the penetrant remover leaked from these washing means.

[0004] Therefore, since it becomes large horizontally as the whole substrate washing station, a floor space required for installation becomes large and many of space of an expensive clean room is occupied, the cost for installation of equipment and operation will become large. Furthermore, enlargement of a substrate also progresses according to a need inclination in recent years, and enlargement of equipment is posing a problem increasingly.

[0005] Then, a substrate is conveyed in the vertical direction with the vertical posture in which the normal of the principal plane is horizontally suitable mostly, and development of the equipment which performs washing processing is furthered.

[0006]

[Problem(s) to be Solved by the Invention] By conveying a substrate in the vertical direction with a vertical posture, and performing washing processing, the floor space which equipment occupies can be stopped small. Moreover, other washing processings like brush washing which sake [washing] for example, flows and removes a big affix using the penetrant remover from which a penetrant remover flows and falls along with the principal plane of a substrate also in washing processing, and which falls can be performed rationally.

[0007] However, it is also a fact that many problems of the proper by holding a substrate with a vertical posture arise.

[0008] First, the 1st problem is the point that desiccation nonuniformity arises in a substrate, when it is going to perform washing / desiccation processing by turning a substrate up, conveying it from a lower part, and passing a washing means and a desiccation means in order, and some substrates already get dry at the time before passing a desiccation means and desiccation processing is performed in such the condition. Since this is

maintaining the substrate at the vertical posture, it originates in flowing away promptly compared with the case where the penetrant remover breathed out towards the substrate holds a substrate to a horizontal position.

[0009] Next, the 2nd problem is the point that it may have a bad influence on other washing processings in which the penetrant remover used for the washing processing performed in the upper part of a substrate meets and flows, and performs a substrate in the lower part of a substrate. Although this will serve as a deployment of a penetrant remover as above-mentioned if the penetrant remover which flows and falls a substrate can be used by downward washing, such [always] effectiveness is not necessarily acquired by it and it may have a bad influence conversely depending on the class of downward washing.

[0010] Furthermore, the 3rd problem is a problem that will have to arrange each washing means in the vertical direction, and an equipment overall height will become high in order to convey a substrate in the vertical direction with a vertical posture.

[0011] As mentioned above, in conveying a substrate up and down with a vertical posture and performing washing processing, while many problems occur and the quality of a substrate deteriorates by this, the maintenance of rational equipment also becomes difficult. Consequently, it has the technical problem that the manufacturing cost per substrate will become high.

[0012] Then, this invention having been made in view of the above-mentioned technical problem, and conveying a substrate up and down with a vertical posture, it is a substrate washing station which performs washing processing, and aims at offering the substrate washing station which can aim at rational substrate washing that the improvement in the quality of a substrate and the maintenance of efficient and rational equipment are possible.

[0013]

[Means for Solving the Problem] A washing means for invention of claim 1 to be a substrate washing station which performs washing processing to the substrate held at the vertical posture as the normal of a principal plane is horizontally suitable mostly, and to wash said principal plane of said substrate, A pure-water supply means to be established above said washing means, to be established between a desiccation means to dry said substrate, and said washing means and said desiccation means, and to supply pure water to said principal plane of said substrate, It has said washing means, said pure-water supply means, and a conveyance means to move a substrate relatively to said desiccation means, and to pass each [these] means in the sequence concerned.

[0014] The washing process which invention of claim 2 is the substrate washing approach of performing washing processing to the substrate held at the vertical posture as the normal of a principal plane is horizontally suitable mostly, and washes said principal plane of said substrate, It has the pure-water supply process which supplies pure water to the field which washing completed in said washing process among said principal planes, and the desiccation process which dries the field to which pure water was supplied at said pure-water supply process of said substrate.

[0015] The processing unit which invention of claim 3 is a substrate washing station which performs washing processing, supplying a penetrant remover to the substrate held at the vertical posture so that the normal of a principal plane may be horizontally suitable mostly, and performs processing which includes washing in said substrate, A conveyance means to pass said substrate in the vertical direction relatively to said processing unit, Two or more processing means by which the preparation and said processing unit met said principal plane of said substrate, and were arranged in the vertical direction, One or more [which is extended to the side near the field which contains said principal plane so that the upper part of at least one processing means or a lower part may be divided among said two or more processing means] inclined batches, It is a means to wash while it **** and at least one of said two or more processing means supplies said penetrant remover to said substrate.

[0016] Invention of claim 4 is a substrate washing station according to claim 3, and one of said two or more processing means is a ultrasonic-cleaning means to perform ultrasonic cleaning to said principal plane of said substrate, one of said one or more inclined batches is the batch which divides the upper part of said ultrasonic-cleaning means, and it inclines toward a side lower part near the field containing said principal plane.

[0017] Invention of claim 5 is a substrate washing station according to claim 3, and one of said one or more

inclined batches is the batch which divides the lower part of said means to wash, and it inclines toward the side upper part near the field containing said principal plane.

[0018] Invention of claim 6 is a substrate washing station which performs washing processing using a penetrant remover to the substrate held at the vertical posture so that the normal of a principal plane might be horizontally suitable mostly. The body section which performs said washing processing using said penetrant remover to said substrate while conveying said substrate, The tank which stores the penetrant remover used in said body section, and a penetrant remover circulation means to lead the penetrant remover used for said body section to said tank, and to supply the penetrant remover in said tank to said body section, It has a washing means by which a preparation and said body section perform washing processing using said penetrant remover to said substrate, and a conveyance means to pass said substrate in the vertical direction relatively to said washing means, and said tank is arranged in the side of the under floor in which said body section is installed, or said body section.

[0019]

[Embodiment of the Invention] Drawing 1 is the perspective view showing the whole substrate washing station 1 concerning this invention which is the gestalt of operation of one, and drawing 2 is drawing showing conveyance actuation of this substrate washing station 1. In addition, by drawing 2, it is a side sectional view in the center of equipment by the Y-Z side of the substrate washing station 1 shown in drawing 1, and conveyance actuation of equipment 1 is shown by showing only a required thing. Hereafter, the whole substrate washing station 1 configuration and conveyance actuation are explained using drawing 1 and drawing 2.

[0020] Holding this substrate washing station 1 into the posture, i.e., the vertical posture in which the normal of a principal plane is horizontally suitable, in which that principal plane contains an apparent vertical for a substrate 9 Are equipment which conveys a substrate 9 in the vertical vertical direction, and performs washing processing, and as shown in drawing 1, it roughly divides. In the container 411 which receives the pure water after the use which is a penetrant remover from the processing section 2 which performs washing and desiccation processing to a substrate 9, the 1st attaching part 31 which conveys a substrate 9 in the vertical direction with a vertical posture and the 2nd attaching part 32, and the processing section 2, and a row It consists of the pure-water circulation sections 5 which supply again the pure water after the use received with the container 411 to the processing section 2.

[0021] The 1st attaching part 31 is arranged under the processing section 2, and conveys a substrate 9 inside the processing section 2 from the lower part of the processing section 2. This 1st attaching part 31 consists of one pair of shaft sealing 330 prepared in the penetration location to the container 411 of the combination of 2 sets of pulleys 318 with which one pair of belts 317 connected to each of the both ends of the contact maintenance base 316 in which a substrate 9 is laid, and the contact maintenance base 316, and a belt 317 are attached, and a pulley 319, 1 set of shafts J1 (configuration illustration abbreviation) which transmit rotation to a pulley 319, and a shaft J1.

[0022] One pair of belts 317 will exercise through a pulley 319, and a shaft J1 will serve as vertical motion of the contact maintenance base 316, if it connects with the rotation driving source which is not illustrated and a shaft J1 rotates by this rotation driving source. By this, the substrate 9 laid in the contact maintenance base 316 will be conveyed from a lower part in the processing section 2 interior, as shown in drawing 2 (a). In addition, the substrate 9 under conveyance by the 1st attaching part 31 is guided with the guide which is not illustrated, and falls from the contact maintenance base 316.

[0023] The 2nd attaching part 32 has the adsorption attaching part 322 which carries out adsorption maintenance of the substrate 9 as shown in drawing 1. It connects with the direct-acting driving source which is not illustrated, and by driving this direct-acting driving source, the 2nd attaching part 32 is movable up and down, as shown in an arrow head Pul. Thereby, the substrate 9 in which adsorption maintenance was carried out by the adsorption attaching part 322 is conveyed up and down. In addition, in drawing 1, illustration of the guide which guides vertical migration of the 2nd attaching part 32 is omitted. Moreover, the adsorption attaching part 322 can be evacuated so that the principal plane of a substrate 9 may be approached horizontally

and it may separate from advance or a principal plane by the driving source which is not illustrated.

[0024] Next, the substrate conveyance actuation using these 1st and 2nd attaching parts 31 and 32 is explained using drawing 2.

[0025] First, the substrate 9 laid on the contact maintenance base 316 of the 1st attaching part 31 like is conveyed upwards by drawing 2 (a) towards the interior of the processing section 2. Then, as shown in drawing 2 (b), when the upper limit of a substrate 9 passes through the processing section 2, the adsorption attaching part 322 of the 2nd attaching part 32 which had evacuated carries out advance migration towards the front face of a substrate 9, and as shown in drawing 2 (c), adsorption maintenance of the substrate 9 is carried out. Here, the rise of the 1st attaching part 31 stops, a substrate 9 separates from the contact maintenance base 316, and is further conveyed upwards by only the 2nd attaching part 32, and a substrate 9 is completely drawn out from the processing section 2.

[0026] By such delivery actuation of the 1st and 2nd attaching parts 31 and 32, a substrate 9 is conveyed so that it may pass through the processing section 22, and the processing section 2 performs processing which includes washing processing to a substrate 9 in the meantime.

[0027] In the above, although the outline of the configuration of the substrate washing station 1 concerning this invention which is the gestalt of operation of one, and actuation has been explained next, the configuration and washing actuation of the processing section 2 in this equipment 1 are explained.

[0028] Drawing 3 is drawing showing the internal structure of the processing section 2, and is drawing showing the side cross section in the center of the processing section 2 by the field parallel to the Y-Z side in drawing 1.

[0029] The processing section 2 is arranged together with order along with the front **** principal plane of the substrate 9 with which various washing means etc. are conveyed in the vertical direction, and has the structure where these various washing means etc. are covered with covering 211. With the gestalt of this operation, one pair of brushes 201, the pure-water injection nozzle 202, the ultrasonic-cleaning nozzle 203, the pure-water supply nozzle 205, and the air knife 204 are arranged respectively together with order toward the upper part from the lower part as various washing means etc. Moreover, the 1st batch 221 is formed between the ultrasonic-cleaning nozzle 203 and the pure-water supply nozzle 205.

[0030] The substrate 9 which has ***** conveyed by the 1st and 2nd attaching parts 31 and 32 from a lower part passes through between washing means various [these] by which each makes a pair etc., and brush washing, pure-water jet cleaning, ultrasonic cleaning, pure-water supply, and desiccation are performed sequentially from the upper part of a substrate 9.

[0031] In addition, the brush 201 in drawing 3, the ultrasonic-cleaning nozzle 203, and the air knife 204 are carrying out the long configuration in the direction of X shown in drawing 1, omit a internal structure in drawing 3, and show only the appearance. Moreover, the pure-water injection nozzle 202 has the composition that two or more nozzles are located in a line in the direction of X, and the side face of one pair of nozzles is shown in drawing 3. Furthermore, the pure-water supply nozzle 205 is carrying out the configuration where two or more openings were turned and prepared in long tubing on the conveyance way of a substrate 9 in the direction of X, and shows it in drawing 3 in the cross section. Moreover, pure water is supplied to the pure-water injection nozzle 202, the ultrasonic-cleaning nozzle 203, and the pure-water supply nozzle 205 from the pump 52 shown in drawing 1, air is supplied to the air knife 204 from the air supply means which is not illustrated, and the brush 201 is rotated with the rotation means which is not illustrated.

[0032] The washing processing of a substrate 9 itself is completed by these washing processings for the purpose of brush washing, pure-water jet cleaning, and ultrasonic cleaning removing the affix of the class from which the substrate 9 differed among the processings performed by these various washing means etc., respectively. Moreover, in order to remove moisture from the substrate 9 which washing processing completed, air is injected from an air knife 204.

[0033] The pure-water supply nozzle 205 has prevented desiccation nonuniformity by wetting the front face of a substrate 9, just before performing desiccation processing by the air knife 204 to a substrate 9, and losing partial desiccation of the substrate 9 in the time of performing desiccation processing. Thereby, by conveying a

substrate 9 with a vertical posture, the moisture given to the substrate 9 flows, and it falls by washing processing, and dries partially, and the trouble that desiccation nonuniformity arises is conquered. Consequently, the quality and the yield of a substrate can improve and rational substrate washing can be aimed at.

[0034] Moreover, the 1st batch 221 is formed in this processing section 2 interior between the ultrasonic-cleaning nozzle 203 and the pure-water supply nozzle 205. The 1st batch 221 is a tabular member long in the direction of X, and as shown in drawing 3, it inclines a little caudad toward covering 211 near the front face of a substrate 9. After the pure water breathed out from the pure-water supply nozzle 205 flows along the front face of a substrate 9 by this, it is transmitted and the most flows the top face of the 1st batch 221, as shown in an arrow head F1. although the pure water with which supersonic vibration was impressed is breathed out to a substrate 9 and detergency is achieved with the ultrasonic-cleaning nozzle 203, if other liquids are supplied to the regurgitation location (washing location) so much -- the amount of water -- the vibrational energy of a supersonic wave can weaken by increment, and there is a possibility that detergency may fall. However, with this operation gestalt, the amount of the pure water which gets across the front face of a substrate 9 to the washing location of the ultrasonic-cleaning nozzle 203, flows and falls from the upper part according to an operation of the 1st batch 221 is reduced sharply, and reduction of the detergency by the ultrasonic-cleaning nozzle 203 can be prevented. Consequently, efficient and rational substrate washing can be aimed at through improvement in the quality and the yield of a substrate.

[0035] Furthermore, the lower part of the covering 211 of the processing section 2 is crooked toward the front face of a substrate 9. That is, the lower part of covering 211 serves as the 2nd batch 222 which divides a brush 201 and the space of the lower part of the processing section 2. By this, as shown in arrow heads F1, F2, and F3, after the pure water from the pure-water supply nozzle 205 is transmitted in the top face of the 1st batch 221, it is transmitted in the wall of covering 211, and the top face of the 2nd batch 222, and flows into the field W near the front face of a substrate 9. The flow of the pure water which is the penetrant remover used by the washing processing which transmits and flows the front face of a substrate 9 as it is breathed out from the ultrasonic-cleaning nozzle 203 and the pure-water injection nozzle 202 and is shown in arrow heads F4 and F5 is joined. Consequently, in Field W, much water will be supplied to the front face of a substrate 9, and preliminary moisture supply before brush washing will be performed using the pure water used in various upper washing means etc. Thus, by forming the 2nd batch 222 extended to the side upper part near the front face of a substrate 9, pure water can be used effectively and efficient and rational substrate washing can be aimed at.

[0036] Moreover, although the pure water used in the processing section 2 by preparing a batch in the processing section 2 interior as mentioned above can be effectively used only in a required part Furthermore, since it is lost that the pure water after the use which disperses from various washing means etc. affects other washing means etc., spacing, such as various washing means, can be made small and the height of the processing section 2 can be stopped small. Consequently, an equipment overall height can be stopped low, the conditions required of an equipment installation are eased, and efficient and rational substrate washing can be aimed at.

[0037] In the above, although the washing actuation in the processing section 2 has been explained next, the configuration and actuation of the pure-water circulation section 5 which supply the pure water which is a penetrant remover to the processing section 2 are explained.

[0038] It consists of a supply pipe 54 which is a pure-water supply way from the pump 52 supplied to the processing section 2, and the pump 52 to the processing section 2, and an exhaust pipe 53 which leads the pure water after the use which flowed and fell to the container 411 to a tank 51, the pure-water circulation section 5 having a filter in the tank 51 and the interior which store the pure water after use, and filtering the pure water from a tank 51, as shown in drawing 1.

[0039] The pure water used in the processing section 2 is stored in a tank 51 through a container 411 and an exhaust pipe 53 by the above configuration. Moreover, the pure water stored by the tank 51 will be supplied to the processing section 2 through the filter in a pump 52 and a pump 52, and a supply pipe 54, and will be again

used for washing etc. Thus, by using it, circulating pure water, it becomes usable [economical pure water] and efficient and rational substrate washing can be aimed at.

[0040] Moreover, as shown in drawing 1, the tank 51 and the pump 52 are arranged under the floor 99 in the clean room where the processing section 2 etc. is arranged, and, thereby, can stop an equipment overall height low sharply. Consequently, the conditions required of an equipment installation are eased and efficient and rational substrate washing can be aimed at.

[0041] Of course, a tank 51 and a pump 52 may be arranged not to the bottom of a floor 99 but to the side of a container 411, and can stop an equipment overall height similarly also in this case.

[0042] Although the substrate washing station 1 which is applied to this invention above and which is the gestalt of operation of one has been explained, this invention is not limited to the gestalt of the above-mentioned implementation.

[0043] With the gestalt of the above-mentioned implementation, although it was the posture in which a substrate 9 contained an apparent vertical, if it is in the condition (vertical posture) that the principal plane of not only this but the substrate 9 is horizontally suitable mostly, even if it leans, the same effectiveness will be acquired.

[0044] Moreover, this is conditions required in order to perform desiccation processing, and if it performs only washing processing, without using an air knife 204, you may make it convey a substrate 9 from the upper part to a lower part with the gestalt of the above-mentioned implementation, although the substrate 9 is conveyed upwards from the lower part.

[0045] Moreover, although the substrate 9 is conveyed up and down, you may make it move by moving the processing section 2 up and down, with the gestalt of the above-mentioned implementation, so that a substrate 9 may pass the processing section 2 relatively.

[0046] Moreover, although the substrate 9 is conveyed using the 1st and 2nd attaching parts 31 and 32, you may make it convey with the gestalt of the above-mentioned implementation only using one attaching part, without performing such delivery.

[0047] Moreover, with the gestalt of the above-mentioned implementation, although one pair of various washing means etc. are established in the processing section 2 interior, respectively, as long as it is unnecessary, you may not be and a required thing may be added only with sufficient one side.

[0048] Moreover, in the processing section 2 interior, all the various washing means using pure water are not supplied, but as long as it is required, you may make it supply from the pure-water supply means from the equipment outside about some washing means with the gestalt of the above-mentioned implementation, although pure water is supplied to the processing section 2 through the filter of the pump 52 and pump 52 interior.

[0049] Furthermore, although the 1st and 2nd batches 221 and 222 are formed, you may make it prepare much more batches with the gestalt of the above-mentioned implementation. For example, by preparing the same thing as the 2nd batch 222 above a brush 201, pure water gathers in the washing part of a brush 201, and effective washing of it is attained. Moreover, only a required part is good and these batches may also be prepared only in one side of a substrate 9, without making a pair.

[0050]

[Effect of the Invention] As explained above, in invention according to claim 1, it is the upper part of a washing means, and by establishing a pure-water supply means under the desiccation means, desiccation nonuniformity can be prevented and, thereby, efficient and rational substrate washing can be aimed at through improvement in the quality and the yield of a substrate.

[0051] In invention according to claim 2, by establishing a pure-water supply process between a washing process and a desiccation process, desiccation nonuniformity can be prevented, thereby, the quality and the yield of a substrate can be improved and efficient and rational substrate washing can be aimed at.

[0052] In invention according to claim 3, by preparing one or more inclined batches so that the upper part of at least one processing means or a lower part may be divided among two or more processing means, optimum

dose supply can be carried out in the location of a request of a penetrant remover, and a deployment of a penetrant remover is attained. Thereby, efficient and rational substrate washing can be aimed at through the improvement in the quality and the yield of a substrate, and reduction of a manufacturing cost. Moreover, two or more effects of both processing means can also be barred, spacing of the processing means of these plurality can be made small by this, and the height of a processing unit can be stopped. By this, the overall height of a substrate washing station can be stopped low, the conditions required of an equipment installation are eased, and efficient and rational substrate washing can be aimed at further.

[0053] In invention according to claim 4, since the batch which inclines toward the side lower part of a substrate is prepared above a washing means, the amount of the penetrant remover which transmits and flows in a substrate from the upper part of a ultrasonic-cleaning means can be reduced, and reduction of the cleaning effect of a ultrasonic-cleaning means can be prevented. Thereby, the quality and the yield of a substrate can improve and efficient and rational substrate washing can be aimed at.

[0054] In invention according to claim 5, since the batch which inclines toward the side upper part of a substrate under the washing means is prepared, the penetrant remover used for the location which needs a lot of penetrant removers in the upper part can be collected and used, and a penetrant remover can be used effectively. While washing capacity improves and the quality and the yield of a substrate improve by this, a manufacturing cost is reduced, and efficient and rational substrate washing can be aimed at.

[0055] In invention according to claim 6, since it is used circulating a penetrant remover through the tank of an under floor or the body section side using a penetrant remover circulation means, the overall height of a substrate washing station can be stopped low, using a penetrant remover effectively. Thereby, while reducing the manufacturing cost of a substrate, the conditions required of an equipment installation are eased and efficient and rational substrate washing can be aimed at.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the perspective view showing the whole substrate washing station configuration concerning this invention which is the gestalt of operation of one.

[Drawing 2] It is the explanatory view of the substrate washing station shown in drawing 1 of operation.

[Drawing 3] It is the side sectional view showing the internal structure of the processing section.

[Description of Notations]

- 1 Substrate Washing Station
- 2 Processing Section
- 5 Pure-Water Circulation Section
- 9 Substrate
- 31 1st Attaching Part
- 32 2nd Attaching Part
- 51 Tank
- 52 Pump
- 53 Exhaust Pipe
- 54 Supply Pipe
- 99 Floor
- 201 Brush
- 202 Pure-Water Injection Nozzle
- 203 Ultrasonic-Cleaning Nozzle
- 204 Air Knife
- 205 Pure-Water Supply Nozzle
- 221 1st Batch
- 222 2nd Batch

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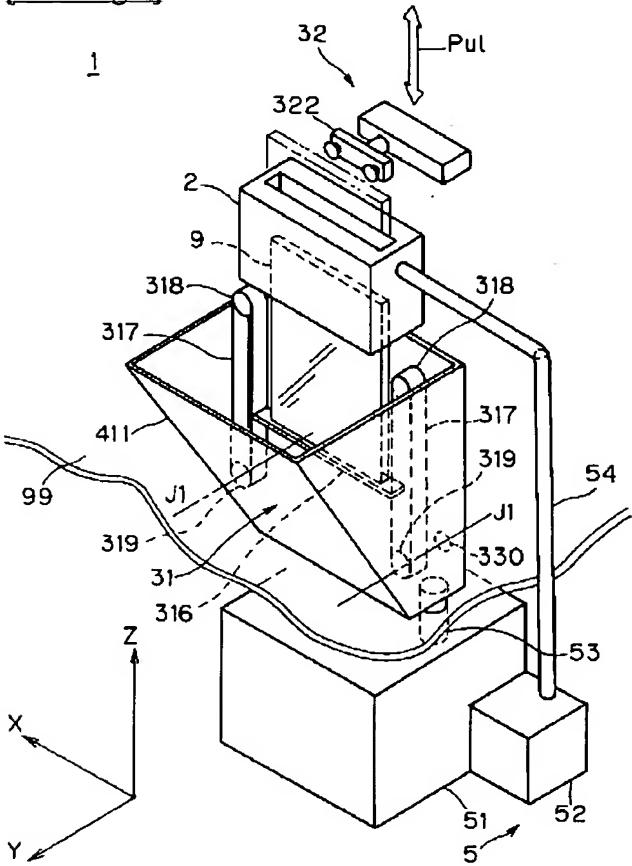
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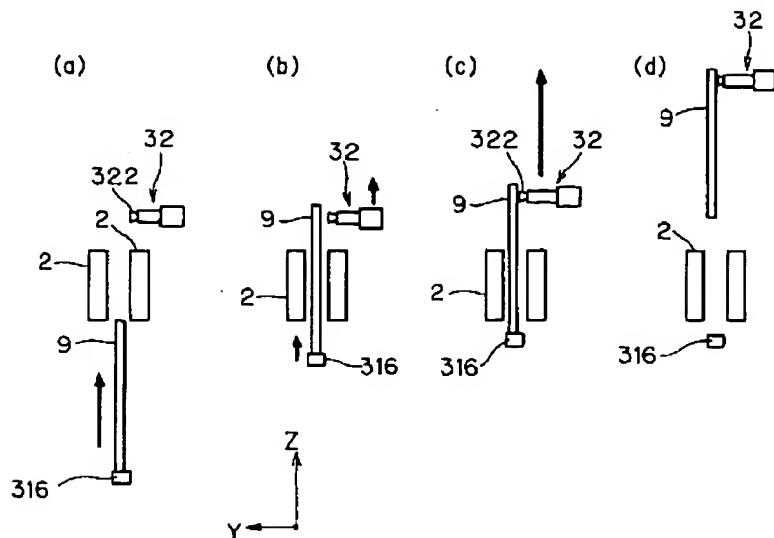
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3. In the drawings, any words are not translated.

DRAWINGS

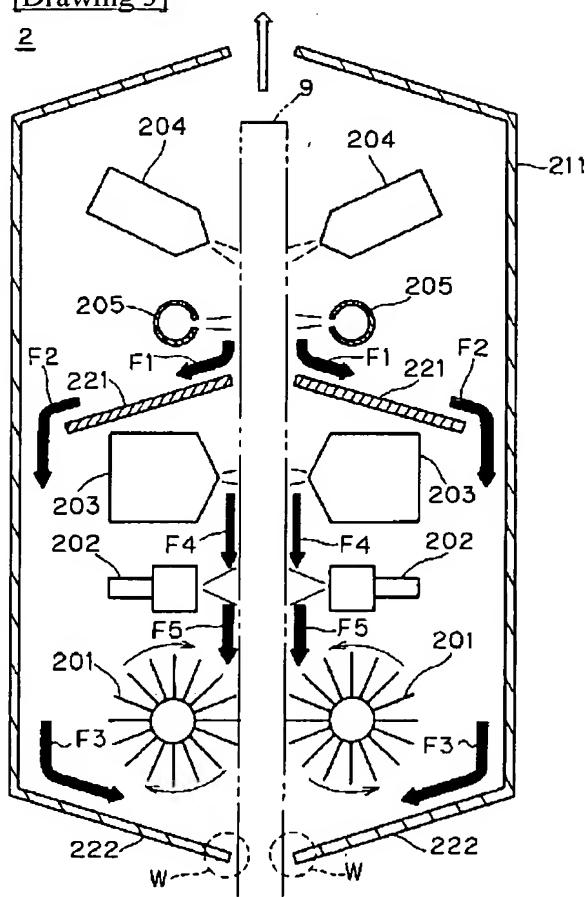
[Drawing 1]



[Drawing 2]



[Drawing 3]



[Translation done.]